Quadratics: Zero Product Property

The zero product property is used to find the ***x-intercepts (also called zeros or roots)*** of a quadratic equation. If m*n = 0, then either m = 0 or n = 0 or both variables equal zero.

Use the Zero Product Property when a quadratic equation is in one of the following forms:

1. $ax^2+bx=0$
2. $ax^2+bx+c=0$
3. $ax^2+bx=c$
4. $ax^2+c=bx$
5. $ax^2=bx+c$

To use the ZPP you **must** first make the quadratic equation equal to 0! Won't get all solutions if not equal to zero.

Steps to follow when using ZPP

a. Make the equation equal to zero
b. Factor the quadratic
c. Make each factor equal to zero and solve for the x-intercept(s) using algebra.
d. Write the solution set

Do **NOT use the ZPP when the b-value is 0 (no b-value no zero product property!)

$4x^2+8=0$

$9x^2=12$

Ex: Find the x-intercepts (also called finding the zeros or roots)

1.

$y=8x^2-4x$

$0=8x^2-4x$

$0=4x\cdot(2x-1)$

$4x=0$ or $2x-1=0$

$\frac{4x}{4}=\frac{0}{4}$

$x=0$

$+1 \quad +1$

$2x=1$

$\frac{2x}{2}=\frac{1}{2}$

$x=\frac{1}{2}$

2 solutions: $\boxed{x=0 \text{ or } \frac{1}{2}}$

* make a 2nd toolkit card for the examples below

Quadratics: Examples using ZPP

Ex 1: Find the roots

$$16x^2 = -16x - 4$$
$$-16x^2 \qquad -16x^2$$

$$0 = -16x - 4 - 16x^2$$
$$0 = -16x^2 - 16x - 4$$
$$0 = -4(4x^2 + 4x + 1)$$
$$0 = -4(2x+1)(2x+1)$$

$\cancel{-4 = 0}$ ~~or~~ $2x + 1 = 0$ or $2x+1=0$

$$-1 \quad -1$$

$$2x = -1$$
$$\frac{2x}{2} = \frac{-1}{2}$$
$$x = -\frac{1}{2}$$

$x = -\frac{1}{2}$

One solution: $x = -\frac{1}{2}$

Ex2: Find the zeros

$$x^2 + 5x = 6$$
$$\underline{\quad -6 \quad -6}$$
$$x^2 + 5x - 6 = 0$$
$$(x+6)(x-1) = 0$$

If you use the table to factor then do the table off to the side. It is NOT Algebra work!

$$x + 6 = 0 \quad \text{or} \quad x - 1 = 0$$
$$\underline{-6 \; -6} \qquad\qquad \underline{+1 \; +1}$$
$$x = -6 \qquad\qquad x = 1$$

2 solutions: $\boxed{x = -6 \text{ or } 1}$